Investigation of a New Couples Intervention for Individuals with Brain Injury: A Randomized Controlled Trial

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Abstract

Objective: This study aimed to (1) examine the efficacy of a treatment to enhance a couple's relationship after brain injury (BI) particularly in relationship satisfaction and communication; and (2) determine couples' satisfaction with this type of intervention. Design: Randomized Wait-list Controlled (WC) Trial. Setting: Midwestern outpatient BI rehabilitation center. Intervention: The Couples CARE intervention is a 16 week, 2-hour, manualized small group treatment utilizing psychoeducation, affect recognition and empathy training, cognitive and dialectical behavioral treatments (CBT, DBT), communication skills training, and Gottman's theoretical framework for couples. Participants: Forty-four participants (22 persons with BI and their intimate partner) were randomized by couples to the intervention or WC group, with 11 couples in each group. Main Outcome Measures: Dyadic Adjustment Scale (DAS); Quality of Marriage Index (QMI); 4 Horsemen of the Apocalypse communication questionnaire. Measures were completed by the person with BI and their partner at 3 time points: baseline, immediate post-intervention, 3-month follow-up. Results: The experimental group showed significant improvement at post-test and follow-up on the DAS and the Horsemen questionnaire compared to baseline and to the WC group which showed no significant changes on these measures. No significant effects were observed on the QMI for either group. Satisfaction scores were largely favorable. Conclusion: Results suggest this intervention can improve couples' dyadic adjustment and communication after BI. High satisfaction ratings suggest this small group intervention is feasible with couples following BI. Future directions for this intervention are discussed.

Key Words:

Brain Injury; Relationships; Marriage; Interventions; Couples; Cognitive-Behavioral; Gottman; Dialectical-Behavioral

List of abbreviations:

TBI Traumatic Brain Injury

BI Brain Injury

CBT Cognitive-Behavioral Therapy

DBT Dialectical-Behavioral Therapy

Brain injury (BI) frequently results in substantial changes in cognitive, behavioral, emotional, and physical functions,[1-9] often impacting the person's life as well as their significant other.[10-12] For a variety of reasons, it is common for relationships to become strained after a BI; this includes relationships with spouses and significant others.[13-19] While there is a broad range of reported prevalence of marital breakdown after a BI (15% to 78%),[18] it is widely acknowledged that relationship distress in couples is especially prominent after BI.[11-18] Some studies indicate that the success of a couple may contribute to a survivor's overall rehabilitation outcome,[18] and that those who live within adaptive relationships are more likely to demonstrate better outcomes.[11] As such, it has been suggested that rehabilitation outcomes for persons with BI may be optimized by providing assessments and interventions for couples.[18]

Several studies have attempted to learn which factors might be relevant to relationship problems after BI. Not surprisingly, several studies found emotional dyscontrol (i.e., mood swings, impulsivity, apathy, aggression, and diminished empathy) to be a significant correlate.[12,20] Another study, which used a focus group to gain greater insight into post-BI relationship challenges found poor communication to be a prominent theme.[11] The authors concluded that communication problems were largely influenced by deficits in language, cognition, physical functions, nonverbal expression, and recognition of feelings. Challenges with communication and emotional dyscontrol after BI are likely to exacerbate typical relationship stressors, such as misunderstandings, misattributions, and unmet needs.[12,21]

Research examining reasons for marital satisfaction in the general population have found similar themes associated with marital distress: negative behavior and communication (criticism,

hostile responses, defensiveness),[22-25] emotional dysregulation,[26-27] maladaptive attributions regarding the partner's motives,[28-31] and poor coping.[32-33] As such, the framework for marital therapy in non-BI couples typically addresses these areas.[26] To address these issues, Cognitive Behavioral Therapy (CBT) has been one of the most widely used approaches to help individuals with BI and caregivers develop more adaptive appraisals and utilize appropriate problem-solving strategies.[34-35] Use of Dialectical Behavior Strategies have also demonstrated efficacy when treating individuals[27] and couples[26] without BI with emotional dysregulation. Additionally, John Gottman, a leader in marital research and interventions, provides a highly effective framework for improving communication styles, decreasing negative exchanges, and improving overall relationship interactions that have been well-documented in the general population. [36]

Despite the prevalence and importance of relationship distress after BI, therapeutic interventions specialized for the BI population is a need that largely remains unmet. Yeates et al.[37] used retrospective data from four individual case studies to review effects of Emotion-Focused (EFT) Therapy on couples' relationship after brain injury. This was not a group intervention. Sessions ranged from 6-25. Three out of four couples showed therapeutic success. The authors found it was possible to conduct couples therapy in persons with BI, but the authors made some suggestions regarding the specific use of EFT in such couples based on their findings. The only other study found was a similar type of retrospective case study using EFT in two couples, only one of which included TBI.[38] Over the course of twenty sessions, this couple eventually learned to identify their emotional cycle, underlying emotions, unmet needs, as well as restructure their interactions, share emotional experiences, and better problem-solve. These

case studies demonstrate the feasibility of conducting couples' treatment in individuals with BI. However, no studies have been found prospectively examining marital interventions in this population.

To address this critical gap in the literature and brain injury rehabilitation, Backhaus et al[39] developed a 16-week group intervention, *Couples CARE (Caring and Relating with Empathy after Brain Injury)* to enhance a couple's relationship after one of them experienced a BI. Because individuals with BI are susceptible to many challenges within the same domains as non-TBI couples, it is logical to anticipate the same focus areas for treatment would also be applicable to BI marital problems.[19] Thus, Couples CARE focused on many of the themes typically addressed in non-TBI populations. That said, despite similar themes needing to be addressed in TBI and non-TBI relationships, the BI population brings a unique set of challenges that necessitate a specialized intervention (e.g., cognitive deficits, communication deficits). Couples CARE was the first couples' therapy for people with brain injury to be empirically investigated in a prospective study. Couples CARE provides psychoeducation and teaches skills to help in recognizing marital needs, increasing positive communication and behavioral exchanges, teaching emotional regulation skills, and improving coping strategies. In the initial feasibility study, 100% reported satisfaction with the intervention and workbook, and 86% reported satisfaction with the length of the treatment. Participants reported significant improvements over time in relationship satisfaction, quality, and communication.

Given the novelty of this program, its initial favorable outcomes warranted further research as this had only been a feasibility study.[39] The purpose of the present study was to

advance the level of evidence for Couples CARE by examining the efficacy of the intervention at enhancing relationship satisfaction and communication after BI using a randomized, waitlist-controlled (WC) trial. It was hypothesized that participants in this intervention would report significantly better relationship satisfaction and quality, as well as communication skills immediately post-treatment and at 3-month follow-up compared to the WC group.

METHODS

Design

This was a randomized waitlist-controlled (WC) trial evaluating within and between group changes from baseline to immediate and three months post-treatment.

Participants

The study protocol was approved by the institutional review board, and all participants provided pre-participation consent. Individuals with BI and their partners were recruited via flyers to outpatient BI services at a major rehabilitation hospital in the Midwestern United States. Inclusion criteria were (1) history of BI at least six months prior to consent as classified by the Mayo Classification System for defining TBI; [40] (2) between 18 and 75 years old; and (3) in a committed relationship at least 6 months before the injury. Exclusion criteria included (1) severe functional expression or processing difficulties that could preclude group participation, as assessed by the Boston Diagnostic Aphasia Examination (BDAE) - Complex Ideation subtest[41] T <29; (2) active psychosis; (3) neurobehavioral difficulties disruptive to group participation; (4) contemplating separation or divorce; or (5) receiving competitive therapies.

[Insert Figure 1 about here]

Measures

Relationship adjustment and satisfaction

The Dyadic Adjustment Scale (DAS),[42] is a 32-item self-report measure of marital adjustment and satisfaction. The Total Score was used to provide an index of global marital adjustment. Higher scores represent better marital adjustment with scores <92 indicating marital distress. It has good internal consistency reliability (Cronbach's alpha .96), acceptable validity and reliability, and has been recommended for use in the BI population.[43]

Quality of Marriage Index (QMI)

The Quality of Marriage Index (QMI),[44] is a six-item inventory that assesses marriage quality through global ratings. Higher scores reflect better quality, with scores ranging from 6-45. This measure has good internal consistency of (.93-.96). Internal consistency of the QMI[45] with other widely used global measures of marital quality have been assessed and calculated Cronbach's alpha at .94.[46]

Communication

The Four Horsemen of the Apocalypse Questionnaire is a 33-item, true/false questionnaire developed by Gottman[36] that assesses a person's engagement in 4 different destructive patterns of interacting in a relationship: contempt, criticism, defensiveness, and stonewalling. There is no specific cut-off score used to distinguish 'poor' versus 'good' but higher scores represent better communication. This measure is typically used within a clinical setting to determine the strengths and deficits in communication, as well as track progress. Psychometric properties are not established and it has not been previously used in individuals

with BI. However, Gottman's framework has been recommended for use with individuals with BI.[11]

Final Evaluation form

This form, developed by the authors in the initial study[39] consists of 10 questions (five questions on a 1-5 point Likert Scale and five open-ended questions) to examine overall satisfaction and to elicit feedback.

Couples CARE Intervention

The treatment consisted of (1) psychoeducation of BI and relationship changes after BI; (2) identifying relationship needs; (3) empathy and emotional awareness training; (4) stress management and emotional regulation skills; and (5) teaching communication and positive behavioral strategies (see Table 1). Each group was led by two professional facilitators trained at enhancing group process (training detailed in Supplementary Material).

Insert Table 1 here.

Insert Supplementary Material.

Procedures

Screening and Baseline testing

Of the 24 couples who were screened, 22 qualified and consented to participate; 2 did not qualify due to aggression. Two weeks prior to the start of the intervention, couples underwent baseline evaluations. If the couple reported contemplating separation, they were excluded from the study and offered alternative options.

Treatment Allocation and Treatment.

Through rolling recruitment, subjects were randomly allocated via random number generator to treatment or WC group. Group assignment was concealed until all baseline measures were completed. Two treatment groups were formed consecutively. See Figure 1 for consort diagram. One couple withdrew during the treatment intervention due to medical circumstances, but submitted post-treatment and follow-up evaluations. One couple from the control group withdrew during intervention time, as the partner without BI reported he was no longer interested in participating; missing measures from this couple were imputed using the last known value (baseline ratings). Due to the WC design, the research assistants (RA's) who performed data collection were not blinded to the experimental conditions.

Post-treatment immediately following intervention and 3-month follow-up. At completion of the 16th session, outcome measures and a Final Evaluation form were completed. Couples were seated in private rooms to complete their assessments. Assessments were mostly distributed by the RAs and the participants were asked to fill out and complete the questionnaires on their own. Group facilitators were available in the general area, and only entered testing rooms to help answer questions about the assessments. Outcome assessments for the WC groups were conducted within the same week by RA's only. The WC group participants were given the opportunity to participate in the treatment after completion of follow-up. Outcome measures were also completed by individual couples at the 3-month follow-up.

Statistical Analyses

Intent-to-treat (ITT) guidelines were followed and all randomized participants were included in all analyses. Statistical Analyses were completed with SPSS software version 23. A 2x3 mixed-model analysis of variance was run with group as the between-subjects variable (treatment and control) and time as the within-subject variable (baseline, post-treatment, follow-up) to assess the effect of the treatment group on the outcome measures. Shapiro-Wilk's test was used to test normality; Levene's was used to test homogeneity of variance; Box's M was computed to test for equality of covariance matrices; and Maulchy's was used to test sphericity. In cases with sphericity violations, Greenhouse-Geisser estimates were used. All interactions are expressed as group x time for the interaction of group by baseline, post-treatment, and follow-up. Effect size is also reported as partial η^2. An effect size less than .05 was considered small, between .05 and .25 was moderate, and greater than .25 was large. Significance levels were set at $p<.05$ and Bonferroni corrections were used to correct for multiple pairwise comparisons.

RESULTS

See Table 2 for participant demographics and injury-related characteristics at baseline. Majority of those with TBI were classified as moderate to severe and were greater than 1 year post-injury. No significant differences were found between the groups on demographic variables or dependent measures at baseline. Means and standard deviations for all dependent measures by group at each time point are displayed in Table 3.

[Insert Table 2 about here]

[Insert Table 3 about here].

Treatment effectiveness

Relationship Adjustment and Satisfaction (DAS):

A significant interaction effect of group x time was found for the DAS total raw score, with a moderate effect size (F= 4.77, p=.011, partial η^2= .102). Neither group was classified as 'distressed' at baseline. In the experimental group, but not in the WC group, DAS scores improved between baseline and post treatment (p = .027; 95% CI, 0.060 – 0.899) as well as between baseline and follow-up (p = .002; 95% CI, 0.286 – 1.150). Significant change was not detected between post treatment and follow-up (p = .889; 95% CI, -5.591 – 6.409).

Quality of Marriage (QMI):

Neither group was classified as 'poor' at baseline. No group x time interaction was found for the QMI raw score (F= 0.687, p=.506; partial η^2=.016). No main effects on group (F= 0.107, p=.899; partial η^2=.003) nor time (F=4.028, p=.051; partial η^2=.088) were present.

Communication (4 Horsemen of the Apocalypse)

A significant interaction effect of group x time was found for the Four Horsemen raw score, with a moderate effect size (F= 3.194, p= .046, partial η^2= .072). In the experimental group, but not in the WC group, scores improved between baseline and post-treatment (p= .006; 95% CI, 1.613 – 8.296) and from baseline to follow-up (p= .011; 95% CI, 0.934 – 6.495). However, there was no significant change between post-treatment and follow-up (p= .285; 95% CI, -1.240 – 4.002).

Satisfaction Outcomes

Ninety-five percent reported satisfaction with the quality of the service, ninety percent would recommend the group to a friend in similar need, seventy-nine percent were satisfied with workbook; and greater than half were satisfied with length of the treatment (although there was no single clear direction for improving the length). See Tables 4 and 5 for further breakdown of satisfaction ratings and qualitative comments; respectively.

[Insert Table 4 about here].

[Insert Table 5 about here].

DISCUSSION

Despite the documented importance of addressing marital needs after BI, relatively little has been done to-date with respect to examining treatments. Although our previous feasibility study provided some initial support for Couples CARE, the purpose of this study was to advance the level of evidence for this intervention by examining its efficacy with a more rigorous, randomized waitlist controlled trial in the BI population. The results suggest that findings are replicable under more rigorous and controlled conditions, and provide a greater degree of confidence that the changes are a result of treatment and not spontaneous or random changes over time.

Consistent with preliminary findings from our earlier feasibility trial,[39] couples who participated in this intervention reported significant improvements over time in dyadic adjustment and communication, and maintained improvements at follow-up in comparison to the

control group. These findings are similar to other marital group intervention studies in the non-BI populations, focusing on similar themes. [26, 47-48] As mentioned earlier, the BI population brings a unique set of challenges to couples' therapy, which makes the findings from this study particularly novel and exciting outside of the non-TBI literature.

This study showed no significant differences in either group across time with respect to the 'global' quality of the relationship (i.e. QMI). Similar to another a CBT-based intervention in a general population,[48] significant improvements in communication and problem-solving skills were reported, but not for relationship 'quality.' However, these findings were in contrast to the positive changes observed on the QMI in our earlier study.[39] Given these contrasting findings, it is difficult to determine at this point if the QMI is truly a construct of 'quality' or if 'quality' can otherwise be defined as satisfaction, cohesion, consensus, and adjustment to relationship[18] as similarly measured in the DAS.[42] As such, we suggest that more research is warranted with a larger sample size re-examining the QMI.

Majority of participants were satisfied with the intervention, the quality of the service they received, and the workbook. The majority reported that they would recommend this intervention to others with BI. Participants noted value to all the materials, and reported being most appreciative of lessons on BI effects on the relationship, communication and behavioral strategies, empathy skills, recognizing emotions, and coping skills. A frequently reported area of satisfaction was having the opportunity to participate in a group. Benefits of participating in a couples' group intervention include the experience of universality and support given from similar others[49] can often be a reinforcing experience during an otherwise precious time when

individuals are likely to experience the detrimental effects of social isolation after BI.[20-21,50] Other benefits of group experience included cost effectiveness of time and therapist involvement, reduction of dependency on therapist, various learning and modeling of positive behaviors, and security within a structured, systematic method.[49] Our attrition rate of 10% was similar to or better than those reported for similar couples' interventions in BI and non-BI populations, ranging from 11-39%.[26,47-48,51] Satisfaction with length of treatment was variable, with no consistent theme. It seems that many reported that it 16 weeks is a long time, but recognized the importance of the topics presented. There has been no set standard for treatment 'dose' for marital interventions, which have varied from a weekend course to 25 sessions.[26,47-49,51] Future studies may consider examining the proper dosage of sessions for couples' therapy after BI. In spite of the length of treatment and some of the complexity of the information presented in this intervention, our data and satisfaction rates suggest that it is feasible for couples in a BI population to commit the time to participating in this intervention. Potentially, future studies could examine active treatment ingredients to reduce the length of the intervention.

Study Limitations and Future Directions:

This is a preliminary study and is limited by its small sample size; replication is recommended with a larger sample. The study included primarily a Caucasian sample, resulting in a severely restrictive ethnic diversity. The study findings may not represent the full spectrum of TBI severity, given that those with significant cognitive and neurobehavioral impairments were excluded. This study design required participation by both the individual with the BI and their partner together. This study did not assess the applicability of providing the intervention to

only one person in the couple. Getting participation from both partners can be challenging due to various factors, and it is unknown if this intervention would show equal efficacy if only one partner received training and 'practiced' at home without the other being involved in the group. Because facilitators remained available to answer questions for post-treatment assessments, there is a potential for a demand effect or need to please, making this a limitation to the study. However, facilitators were only in the testing rooms to answer questions and were not present when participants were actually responding to questionnaires. Finally, this study did not directly assess sexual satisfaction in spite of several studies identifying high rates of sexual concerns after BI.[18,52-54] As such, future studies may wish to consider employment of such measures.

In terms of couple selection, using several intake sessions to assess readiness of couple to participate in a group intervention is encouraged.[49,55-56] The current authors suggest this approach will allow the clinician to better identify and understand a couples' needs, promote therapist rapport and trust, and guide the therapist as to which areas to focus greater in group. Using objective and subjective data to providing clinical direction may promote efficacy of the intervention. Use of booster and maintenance sessions has also been suggested to increase generalization of strategies and maintain treatment effects.[49] Finally, comparison of an attention control group is recommended for future investigations to examine if changes are directly attributable to the treatment intervention or to group support, as has been demonstrated in other studies. [35]

Reviews of marital intervention studies in the general population and mental health groups are documented.[57] Marital issues after BI and the need for appropriate interventions are

well-documented.[18] However, with exception of a few published marital intervention retrospective case studies,[37-38] the current literature on marital intervention studies in the BI population has been non-existent. In the general population literature, investigators have documented various shortcomings in marital outcome studies including lack of random allocation, use of appropriate control groups, application of appropriate statistical analyses, assessment of pre-treatment and post-treatment functioning, follow-up across subjective and objective measurements, and use of experienced therapists, to name a few.[58] To our knowledge, the current study is one of the first evidence-based treatments addressing some of the aforementioned limitations, specific for couples after BI. This study utilized control group via appropriate randomization strategies, training and use of experienced therapists, adherence to protocol via fidelity checks and structured supervision, justification for statistical analyses used, and appropriate timing of measurement outcomes. Importantly, given the positive findings, these preliminary results suggest that the current psychological framework used appears promising and appropriate for couples within this population. Clinically, prior studies have demonstrated use of CBT methods within this population, but this is the first study to our knowledge that examined utilization of DBT and Gottman methodology with a BI population. Gottman strategies and DBT utilizes an approach of practicing skill-based, behavioral, small steps in order to correct faulty patterns in communication, behaviors, and conflict resolution.[27,36] It seems that given the nature of neuropsychological impairments seen in persons with BI,[59] these types of concrete strategies appear to be an appropriate fit, as had been suggested by others.[18]

CONCLUSIONS

Relationships are often negatively impacted by cognitive, communication, and emotional sequelae of BI. Studies examining the efficacy of specific interventions to address relationships after BI are limited. This is addressed a significant need in treatment after BI, as it is one of the first evidenced-based studies to examine a new intervention to address this populations' marital needs. This study provides promising results demonstrating that dyadic satisfaction and communications skills after BI can be significantly improved when addressing appropriate relationship needs via otherwise well-validated psychological paradigms modulated to a BI population. While these results warrant further investigation due to limitations, they provide hope that Couples CARE is an intervention that, by enhancing dyadic satisfaction, could potentially positively influence rehabilitation outcomes after BI.[11,18]

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TABLE 1: Description of the Couples CARE Contents

Module	Framework
Module 1	**Session 1: Understanding Brain Injury** **Goals:** (1) Discuss the structure and goals of the group; (2) Improve awareness and acceptance of BI-related challenges.
Module 2	**Session 2: Understanding Your Relationship After Brain Injury** **Goal:** Improve understanding of common relationship changes after BI including effects of the injury on the relationship dynamics and changes in roles, routines, and responsibilities.
Module 3	**Session 3 & 4: Addressing Needs in the Relationship** **Goals:** (1) Develop better understanding of each person's unmet relationship needs; (1) Develop strategies for meeting those needs.
Module 4	**Session 5: Improve Your Emotional IQ** **Goals**: (1) Improve emotional connectivity and affect recognition skills; (2) Improve ability to empathize with each other.
Module 5	**Session 6 & 7: Finding Your Balance** **Goals:** Reduce emotional dysregulation and mood swings; improve frustration tolerance and psychological flexibility via use of dialectical-behavioral therapy (DBT) and mindfulness strategies.
Module 6	**Session 8 - 10: Coping with Angst:** **Goals:** (1) Improve individual and dyadic coping with the goals of utilizing healthy cognitive attributions and perceptions toward each other; (2) Improve

	emotional functions; (3) Utilize effective stress management techniques, via use of cognitive-behavioral therapy (CBT).
Module 7	**Session 11-13: Communicate with CARE** **Goals:** (1) Improve interpersonal communication within the relationship and daily life via CBT and DBT skills; (2) Practice Gottman techniques for reducing negative communication styles and replacing those with positive antidotes; (3) and practice adaptive styles for communicating needs.
Module 8	**Session 14: Overwhelm with Deposits** **Goals**: Improve positive exchanges within the relationship and reduce negative ones, to create more of what Gottman refers to as 'positive sentiment override.'
Module 9	**Session 15: Get to Know Your Friend** **Goals**: **(1)** Practice exercises on rediscovering each other's likes and dislikes, habits, and quirks; (2) Rekindle the friendship via Gottman strategies.
Module 10	**Session 16: Relationship Do's and Don'ts** **Goals**: (1) Review concepts learned throughout intervention; (2) Review relationship goals; (3) Develop a plan for how to continue practicing pertinent strategies.

TABLE 2 Participant demographics

Participant demographics n= 44		
	Treatment n=22 (%)	**Control n=22 (%)**
Years of Education:		
< 12 Years	0 (0%)	1 (5%)
High School Diploma	3 (14%)	5 (23%)
Some College	5 (23%)	4 (18%)
College Graduate	3 (14%)	8 (36%)
Post Graduate Work/Degree	11 (50%)	4 (18%)
Age M (sd)	50.09 (10.58)	52.14 (12.39)
% Female	45%	50%
Years married /committed M (sd)	25.7 (5.33)	20.75 (7.43)
0-5:	1 (5%)	1 (5%)
6-10:	0 (0%)	3 (14%)
11-15:	0 (0%)	0 (0%)
16-20:	2 (9%)	2 (9%)
21-29:	6 (27%)	3 (14%)
30+:	2 (9%)	2 (9%)
Race		
White	20 (91%)	21 (95%)
Black or African American	2 (9%)	0 (0%)
Asian/Pacific Islander	0 (0%)	1 (5%)
Survivors Only n= 22		
	Treatment n=11	**Control n=11**
Injury Type		

TBI (moderate-to-severe)	7 (64%)	9 (82%)
Intracranial Hemorrhage	1 (9%)	0 (0%)
Ischemic Stroke	3 (27%)	1 (9%)
Hypoxia	0 (0%)	1 (9%)
TSI in years M(sd)	2.61 (1.35)	4.35 (4.47)
6 – <1 year	0 (0%)	1 (9%)
1 – 2 years	8 (73%)	6 (55%)
3 – 6 years	3 (27%)	1 (9%)
> 6 years	0 (0%)	3 (27%)

TBI = Traumatic Brain Injury; TSI = Time Since Injury

TABLE 3 Means and standard deviations by group across time for dependent measures

Dependent Measure	Treatment Group (n=22)	Waitlist Control Group (n=22)
DAS		
baseline	104.18 ± 26.53	108.86 ± 15.77
post-treatment	114.23 ± 13.28*	109.00 ± 15.57
follow-up	113.82 ± 14.17*	104.32 ± 13.68
QMI		
baseline	31.27 ± 7.98	27.77 ± 8.42
post-treatment	32.23 ± 8.39	27.55 ± 8.52
follow-up	32.32 ± 7.61	26.82 ± 8.37
Four Horsemen		
baseline	20.18 ± 7.84	18.14 ± 8.90
post-treatment	25.14 + 6.71*	19.00 ± 9.83
follow-up	23.81 ± 8.67*	18.55 ± 8.87

NOTE: Values are mean ± SD
DAS = Dyadic Adjustment Scale; QMI = Quality of Marriage Index
* Within group comparisons, indicating significant differences from baseline ($p<.05$). Bonferroni corrections applied.

Table 4. Ratings to Final Evaluation Questions

Evaluation Questions	**Ratings**			
How would you rank the quality of the service you received?	**Excellent** 62%	**Good:** 33%	**Fair:** 5%	**Poor:** 0%
If a friend were in need of similar help, would you recommend our program to him or her?	**Yes, Definitely** 76%	**Yes, Generally** 14%	**No, Not really** 5%	**No, Definitely not** 5%
How satisfied were you with the amount of help you received?	**Very** 57%	**Mostly** 33%	**Indifferent or mildly dissatisfied** 10%	**Quite dissatisfied** 0%
The workbook was easy to follow along and use.	**Strongly Agree or Agree** 79%	**Sometimes** 21%	**Slightly Disagree** 0%	**Disagree** 0%
The length of this group (16 sessions) was appropriate.	**Strongly Agree or Agree** 53%	**Sometimes** 26%	**Slightly Disagree** 21%	**Disagree** 0%

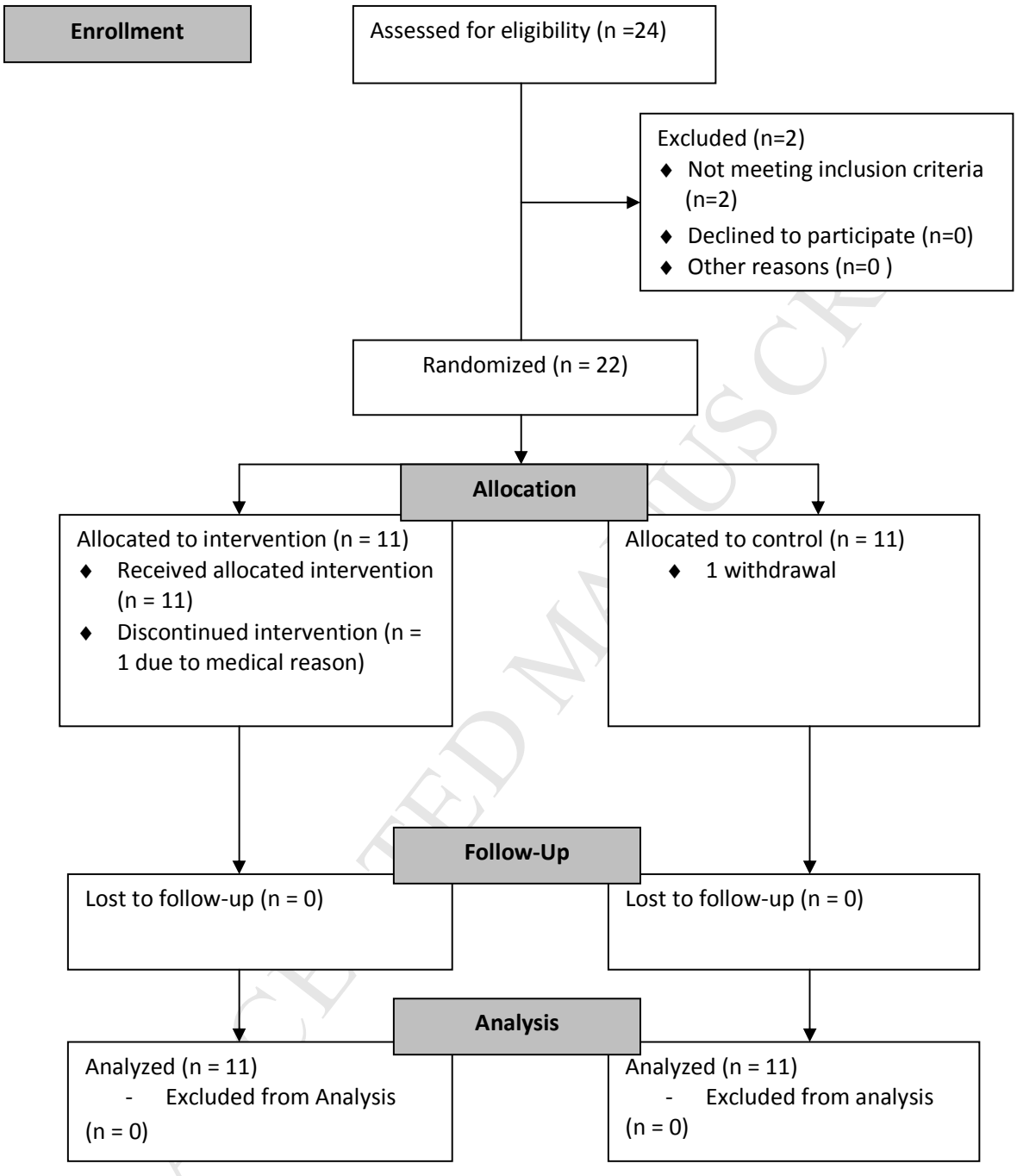
Table 5. Qualitative Comments

Theme	Comments
Recommendations regarding length of sessions and program	• Satisfied with length of treatment • Some sessions went over with a lot of content to cover, but shortening the number of sessions would take away from completeness of the content. • 16 weeks is long commitment, but not sure if it is best to shorten as different topics are important for different people. • Maybe condense some items and while expanding on others. • Condensing length might help, but only by a few weeks at most. • Group discussions were beneficial. • Go slightly longer. • Shorter sessions - less models. Or longer sessions - more group discussions and targeting ideas/solutions that could work for you. • Number of sessions was okay. • Enjoyed the group sessions but attendance was sparse on many weeks. Perhaps the 16 sessions were too long for some. • Class too long to maintain focus and attention, i.e., shorten to about 6 weeks; break for a month; then offer part 2 of same material.
Favorite topics covered in group	• Emotions and modulating reactions…..need more practice • The topics covered were spot on. • Understanding emotions and experience of survivors • Effects of brain injury • Practical application of models/lessons. Hands-on. Facilitated group discussion and maybe break outs? To practice role play. • How to appropriately recognize and respond to triggers in our relationship. • Empathy • The stress management • Dealing with emotional temperature and recognizing triggers • Improving communication skills in the relationship
Recommendations on other topics they would like to learn about	• Head injury impact. • How to recognize triggers and counter-act them. • Intimacy and maintaining a physical relationship. • Family and their effect on the couple with brain injury. • More information on specific relationships challenges for each couple. • Greater focus on dealing with short-term memory loss and behavioral / temperament concerns.
General Comments	• This program has provided many useful tools for recognizing, understanding, and addressing issues that arise in any relationship but especially when complicated by a TBI. These tools and practices in using them have had an immediate and positive impact on my

	relationship with my partner. • Helped me see what I can do to improve our relationship. Moreover, it allowed me an opportunity that I would have never gotten to see my husband's attitude and understanding of my condition change over time. • Index, section identification, better homework, definitions • Modules coupled with experiences and shared situations brought questions into clarity; • Group discussions resulting in knowing I/we were not alone in what we were experiencing. • I really enjoyed the sessions that had a great deal of discussion and sharing, even if getting off-task meant being here a bit later. • These groups are so good and helpful. I am really excited and honored to have been part of this and also the preceding Brain Injury Coping Skills classes. They helped me understand stuff about TBI and our relationship. • There's only such much you can do. There are 2 different people in each couple. Hard to hit every issue. We are heading in the right direction. • Thank you for helping us. We have learned a lot. Not sure where we would have been if we didn't come here. I know we still have a long road ahead, but I feel we are moving together versus going separate. • Thank you both for a wonderful 16-week session. We were so blessed to be part of this study. • Thank you, I needed this. • I appreciated hearing others' experiences with their injuries. • This group has helped us find the importance of continuing to learn about each other. After brain injury we needed to learn about each others needs to continue to grow as individuals and in our marriage. This group has allowed us in a non-threatening way to engage in those conversations. • Loved having time with my spouse and dedicating several hours a week on our relationship. • One of the things that helps me in these groups is learning that other people are experiencing the same or similar emotions, challenges and discoveries. • This became a "date night" for my husband and me. We drove to work together every Tuesday and we are thinking about continuing our Tuesday "commitment". • The group discussions were very beneficial. Hearing how others handle situations. Maybe have a 3rd party success to come in and speak might be good. • Taught my partner a lot about my injury that I didn't know how to communicate and showed him how other survivors felt the same way I did; gave me some creditability.

	• Great skills to carry into our lives when it comes to communication with one another. • I think the people within the group was the most valuable. It's awesome to hear others who have went through trials and moved forward. Just hearing simple things that go a long way within a marriage. I think communication was touched on so much. I feel like I have learned how to be better at communicating with my partner (i.e. speaking and listening). • It's the other participants! Just knowing we are not alone helps. • Discussing our various challenges/problems openly, then allowing others to weigh in. I didn't feel so alone and I learned new ideas of how to better handle certain situations. • Comprehension of material was hard with so much material to digest. A few of these concepts will help to carry forward, but not everything covered. • The time dedicated to this work was therapeutic and enhanced our day-to-day. • Too much reading and comprehension for some survivors (workbook).

Figure 1. Consort Diagram



Supplementary Material: Group process and facilitator experience and training

Group process	Each participant was provided a workbook that included session content, in-session worksheets and activities, and homework assignments. Facilitators were provided a therapist manual with additional details to lead the group. Each session typically included the following: (1) brief review of the prior session, (2) homework review, (3) introduction to a new topic, (4) in-session activity, and (5) instructions for homework. Group discussion and participation were encouraged. The groups were highly dynamic and interactive in nature, but there was a focus on promoting learning of skills and contents. Thus, this was not conducted in a support group style and reminders were continually provided that there was a focus on skill-learning. Couples were encouraged to develop 2-3 relationship goals to work on throughout the 16 weeks and goals were periodically reviewed throughout the intervention. However, the goals themselves were not part of the primary hypotheses or purpose of the group.
Facilitator Experience	Each group was led by a primary and a secondary facilitator. Two experimental groups were led. Thus, there were 2 primary and 2 secondary facilitators. The two primary facilitators included a Ph.D. level neuropsychologist and a clinical researcher, each with greater than 10 years of experience in neurorehabilitation. The neuropsychologist had at least 11 years of experience in conducting individual, group, couples, and family therapy after BI, as well as providing structured and unstructured group treatments in an outpatient BI rehabilitation program. The clinical researcher had experience with cognitive rehabilitation, as

	well as developing and delivering research-based interventions for affect recognition impairments in persons with TBI. She had been working in the field of BI for almost 20 years. Both primary facilitators collaborated to develop the treatment program. With respect to the secondary facilitators, one was a Master's degree student in Clinical Mental Health Counseling with over 2 years of experience in the field of BI and the other was a Counseling Psychologist with a doctoral degree, who had 8 years of experience working in the field of BI and who was completing her post-doctoral fellowship in Clinical Neuropsychology, with a BI rehabilitation focus. Both had at least 2 years of experience in facilitating group interventions.
Facilitator Training	Both primary facilitators and one of the secondary facilitators had previously participated in training and supervision sessions during the original feasibility study.[39] At that time, facilitators were trained on how to administer the first 8 sessions over a day-long course. The course was taught by the lead neuropsychologist who was the principal investigator of the study. Role plays were conducted throughout the training session and the course was taught via a discussion format. Fidelity checklists were provided to everyone, explained item by item, and facilitators were encouraged to review the checklist prior to each session and keep the checklists in front of them while running each session. The purpose of the checklist was to help promote behaviors in facilitators that can promote universality, normalization, and group cohesion. It was also to help promote similarity to teaching content and document any deviations from protocol. There were no deviations from the protocol noted. After the first eight sessions,

	another day-long training was held to review how the first 8 sessions went, problem-solve, proactively provide strategies for managing the second half of the intervention, as well as teach how to conduct the next 8 sessions. The neuropsychologist principal investigator made herself available to other facilitators any time to provide any guidance or strategies for managing certain behaviors, and checked in with the facilitators every 2-3 weeks to ensure adherence to fidelity and help provide strategies to promoting positive group factors. These supervision sessions (sometimes face-to-face or by telephone) were also provided to ensure that all facilitators were running the group in the same manner and covered the same course content, as structured in the manual. When training the Counseling psychologist secondary facilitator, who was new to the study this time, one primary training session was provided; then many sessions were held spread throughout the 16 weeks to teach and discuss several Modules at a time. This secondary facilitator co-led with the principal investigator neuropsychologist of the study, so as to ensure ample face-to-face interactions, feedback, and supervision. Supervision continued to be made available to the other facilitators as well every 2-3 weeks, as described above.